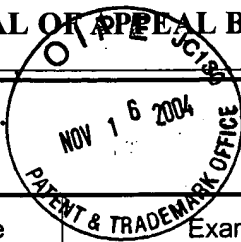


## TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.  
112753-004

In Re Application Of: Glenn et al.



Application No.	Filing Date	Examiner	Customer No.	Group Art Unit	Confirmation No.
10/047,819	January 14, 2002	R. Muromoto, Jr.	24573	3765	4754

Invention: TUBULAR FABRIC AND METHOD OF MAKING THE SAME

COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on

The fee for filing this Appeal Brief is: \$340.00

- ☒ A check in the amount of the fee is enclosed.
- ☐ The Director has already been authorized to charge fees in this application to a Deposit Account.
- ☒ The Director is hereby authorized to charge any fees which may be required, or credit any overpayment to Deposit Account No. 02-1818
- ☐ Payment by credit card. Form PTO-2038 is attached.

**WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.**

Signature

Dated: November 12, 2004

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I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to "Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450" [37 CFR 1.8(a)] on

11-12-2004

(Date)

Signature of Person Mailing Correspondence

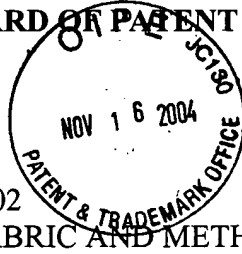
Heather Foster

Typed or Printed Name of Person Mailing Correspondence

CC:

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES**

Applicants: Glenn et al.  
Appl. No.: 10/047,819  
Conf. No.: 4754  
Filed: January 14, 2002  
Title: TUBULAR FABRIC AND METHOD OF MAKING THE SAME  
Art Unit: 3765  
Examiner: R. Muromoto, Jr.  
Docket No.: 112753-004



Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

**APPEAL BRIEF**

Sir:

Appellants submit this Appeal Brief in support of the Notice of Appeal filed on August 13, 2004 and received by the U.S. Patent and Trademark Office on August 16, 2004. This Appeal is taken from the Final Rejection dated June 15, 2004.

**I. REAL PARTY IN INTEREST**

The real party in interest for the above-identified patent application on appeal is Price Shephshed Limited by virtue of an Assignment dated May 20, 2002 and recorded at the United States Patent and Trademark Office at reel 012910, frame 0667.

**II. RELATED APPEALS AND INTERFERENCES**

Appellants, Appellant's legal representative and the Assignee of the above-identified patent application do not know of any prior or pending appeals, interferences or judicial proceedings which may be related to, directly affect or be directly affected by or have a bearing on the Board's decision with respect to the above-identified Appeal.

**III. STATUS OF CLAIMS**

Claims 1-7, 9-19 and 21-26 are pending in the above-identified patent application. Claims 1-7, 9-19 and 21-26 stand rejected. Claims 8 and 20 were canceled in the Amendment

mailed on March 4, 2004. Therefore, Claims 1-7, 9-19 and 21-26 are being appealed in this Brief. A copy of the appealed claims is attached as Appendix A.

#### **IV. STATUS OF AMENDMENTS**

No amendments were made in this application after the final rejection.

#### **V. SUMMARY OF THE CLAIMED SUBJECT MATTER**

A summary of the invention by way of reference to the drawings and specification for each of the independent claims (claims 1, 21 and 23) is attached as Appendix B.

Although specification citations are given in accordance with C.F.R. 1.192(c), these reference numerals and citations are merely examples of where support may be found in the specification for the terms used in this section of the brief. There is no intention to suggest in anyway that the terms of the claims are limited to the examples in the specification. Although as demonstrated by the references numerals and citations below, the claims are fully supported by the specification as required by law, it is improper under the law to read limitations from the specification into the claims. Pointing out specification support for the claim terminology as is done here to comply with rule 1.192(c) does not in any way limit the scope of the claims to those examples from which they find support. Nor does this exercise provide a mechanism for circumventing the law precluding reading limitations into the claims from the specification. In short, the references numerals and specification citations are not to be construed as claim limitations or in any way used to limit the scope of the claims.

#### **VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL**

1. The specification stands objected to based on informalities.
2. Claims 1-26 stand rejected under 35 U.S.C. §112, first paragraph, as failing to comply with the written description requirement.
3. Claims 1-26 stand rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
4. Claims 1-7, 9-13, 17-19 and 21-26 stand rejected under 35 U.S.C. §102(b) as being anticipated by Great Britain Document No. 2309038 to Richardson ("Richardson").

5. Claims 14-16 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Richardson in view of the International Application No. WO 94/28227 (“the ‘227 application”).

## VII. ARGUMENT

### A. Legal Standards

#### 1. Antecedent Basis for Claims Terms and Phrases

A claim term or phrase in a patent application “must find clear support or antecedent basis in the description so that the meaning of the terms in the claims may be ascertainable by reference to the description.” *See* 37 C.F.R. § 1.75(d)(1). In particular, support for claim terminology in mechanical cases “should be identified . . . by reference to the drawing, designating the part or parts therein to which the term applies.” *See* MPEP § 608.01(o). The drawings provide an adequate description of the invention, if the drawings “describe what is claimed and convey to those of skill in the art that the patentee actually invented what is claimed. *Vas-Cath Inc. v. Mahurker*, 19 U.S.P.Q.2d 1111, 1118 (Fed. Cir. 1991).

#### 2. Anticipation under 35 U.S.C. § 102

“Under 35 U.S.C. § 102, anticipation requires that each and every element of the claimed invention be disclosed in the prior art . . .” *Akzo NV v. U.S. International Trade Commission*, 1 U.S.P.Q.2d 1241, 1245 (Fed. Cir. 1986). Moreover, “[a] claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a *single* prior art reference.” *Verdegaal Bros v. Union Oil of California*, 2 U.S.P.Q.2d 1051, 1053 (Fed. Cir. 1987) (*emphasis added*).

#### 3. Obviousness under 35 U.S.C. § 103

Whether a claim is obvious is a question of law that is based on underlying factual inquiries including: (1) the scope and content of the prior art; (2) the level of ordinary skill in the art; (3) the differences between the claimed invention and the prior art; and (4) objective evidence of nonobviousness. *In re Zurko*, 59 U.S.P.Q.2d 1693, 1696 (Fed. Cir. 2001).

The Patent Office has the initial burden of proving a *prima facie* case of obviousness. *In re Rijckaert*, 28 U.S.P.Q. 2d 1955, 1956 (Fed. Cir. 1993). In making this determination, the question is not whether the differences between the prior art and the claims themselves would have been obvious, but whether the claimed invention as a whole would have been obvious. *Stratoflex, Inc. v. Aeroquip Corp.*, 218 U.S.P.Q. 871 (Fed. Cir. 1983)(emphasis added). Obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either explicitly or implicitly in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Kotzab*, 55 U.S.P.Q.2d 1313, 1317 (Fed. Cir. 2000).

The Federal Circuit has held, however, that “obvious to try” is not the standard under 35 U.S.C. §103. *Ex parte Goldgaber*, 41 U.S.P.Q. 2d 1172, 1177 (Fed. Cir. 1996). “An obvious-to-try situation exists when a general disclosure may pique the scientist curiosity, such that further investigation might be done as a result of the disclosure, but the disclosure itself does not contain a sufficient teaching of how to obtain the desired result, or that the claim result would be obtained if certain directions were pursued.” *In re Eli Lilly and Co.*, 14 U.S.P.Q. 2d 1741, 1743 (Fed. Cir. 1990). Also, one cannot use “hindsight reconstruction to pick and choose among isolated disclosures in the prior art” to re-create the claimed invention. *In re Fine*, 5 U.S.P.Q. 2d 1596 (Fed. Cir. 1988). Thus, the mere fact that the prior art can be combined to achieve Appellants’ claimed invention is not enough to demonstrate obviousness. *In re Laskowski*, 10 U.S.P.Q. 2d 1397 (Fed. Cir. 1989). Rather, the prior art, in its entirety, must provide the teaching to make the combination obvious. *In re Gorman*, 18 U.S.P.Q. 2d 1885 (Fed. Cir. 1991).

Of course, “a prior art reference is relevant for all that it teaches to those of ordinary skill in the art.” *In re Fritch*, 23 U.S.P.Q. 1780 (Fed. Cir. 1992). In this regard, “a prior art reference may be considered to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.” *Monarch Knitting Machinery Corp. v. Fukuhara Industrial & Trading Company Ltd.*, 45 U.S.P.Q. 2d 1977 (Fed. Cir. 1998). “If the examination at the initial stage does not produce a *prima facie* case of unpatentability, then without more the applicant is entitled to grant of the patent.” *In re Oetiker*, 24 U.S.P.Q. 2d 1443, 1444 (Fed. Cir. 1992).

B. The Objection to the Specification Should Be Reversed Because the Claims are Supported by the Specification

The specification was objected based on informalities. Specifically, claims 1, 21 and 23 each include the claim limitation that the tubular fabric “does not include an elastomeric yarn.” The Patent Office, however, states that the “specification goes on to state that a preferred yarn is a LYCRA® covered yarn. LYCRA® covered yarns are elastomeric yarns.” The Patent Office therefore states that “[t]his recitation renders the specification unclear.” (See the Final Office Action, page 2, lines 6-10). Appellants respectfully disagree with the objection to the specification.

Independent claims 1, 21 and 23 are directed to a method of making a tubular fabric, a tubular fabric and a garment including a tubular fabric, respectively. Each of these claims include the limitation that the tubular fabric “does not include an elastomeric yarn.” In the Final Office Action, the Patent Office states that this limitation is unclear because the specification “clearly uses an elastomeric yarn (GRILON®/ LYCRA®; pg. 5, line 20) in making and using the invention.” (See the Final Office Action, page 3). The Patent Office also states that “the only yarn recited in the specification of the instant invention is an elastomeric yarn (GRILON®/LYCRA®). (Emphasis Added)(See the Final Office Action, page 4). Appellants respectfully disagree with the Patent Office because the specification does not support the use of an elastomeric yarn in making the tubular fabric of the claimed invention. Additionally, the specification specifically identifies the preferred yarns for making the claimed tubular fabric, none of which are elastomeric yarns.

The tubular fabric of the claimed invention includes a support yarn and a fusible yarn. The fusible yarn is constructed and arranged so that when the fusible yarn melts over the tubular fabric it forms a barrier to penetration by a bra wire upon cooling. The specification clearly states that the tubular fabric does not include an elastomeric yarn. In fact, the specification states that the “in the most preferred aspect [of the invention] the fabric . . . does not have any elastomeric yarn.” (See the specification, page 5, lines 6-7). The specification further states that the “most preferred fusible yarn for use in the invention is a polyamide yarn especially . . . Grilon®.” (See the specification, page 3, lines 4-6). The specification repeatedly states that the preferred fusible yarn in making the tubular fabric of the claimed invention is Grilon® or

Grilon® K-85 (See the specification, page 7, lines 14-15; page 8, lines 23-24; page 12, line 20 to page 13, line 17; page 17, lines 8-10; page 18, lines 3-14). Therefore, the specification specifically states the preferred yarn used to make the tubular fabric of the claimed invention (i.e., Grilon®), which does not include LYCRA® or any other elastomeric yarn.

The Patent Office states that the specification indicates that the claimed invention includes an elastomeric yarn. Specifically, the Patent Office cites the paragraph beginning at line 15 of page 20 of the specification as indicating that the claimed invention includes an elastomeric yarn. This paragraph states the following:

For the yarn to be considered as performing the role of a support and/or fusible yarn, it must comprise by weight at least 10%, preferably 25%, more preferably at least 50%, even more preferably at least 75%, yet more preferably at least 90%, most preferably at least 95% of the total weight of support and/or fusible yarn present in the fabric. Suitable yarns for this purpose include Grilon® covered Lycra®.

Appellants respectfully disagree with the Patent Office. The above paragraph identifies the parameters under which a yarn is typically considered a support and/or fusible yarn. The paragraph then provides one example of a suitable yarn, Grilon® covered Lycra®, which meets the parameters. This paragraph does not state that the tubular fabric of the claimed invention is made with Grilon® covered Lycra® or any other elastomeric yarn. Additionally, no other paragraphs in the specification state that Grilon® covered Lycra® is used to make the claimed invention. Appellants submit that there are several different types of support and/or fusible yarns, one of which is Grilon® covered Lycra®. However, the specification does not state that a preferred yarn of the claimed invention is Grilon® covered Lycra® or any other Lycra® product. As described above, the specification and the claims specifically state that the support yarn and fusible yarn which form the tubular fabric of the present invention do not include an elastomeric yarn. Accordingly, a person of ordinary skill in the art would clearly know that the claimed invention does not include an elastomeric yarn based on the specification and the claims of the above-identified patent application.

C. The Rejection of Claims 1-26 under §112, first paragraph, Should Be Reversed Because the Claims are Supported by the Specification

The Patent Office rejected Claims 1-26 under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement because claims 1, 21 and 23 require the negative limitation that no elastomeric yarns be present in the invention, where the specification states that an elastomeric yarn is used to make the invention. (See the Final Office Action, page 3).

As described above, the specification and the claims state that the support yarn and fusible yarn which form the tubular fabric of the present invention do not include an elastomeric yarn. A person of ordinary skill in the art therefore would clearly know that the claimed invention does not include an elastomeric yarn based on the specification and the claims of the above-identified patent application. Therefore, the rejection of Claims 1-26 under §112, first paragraph, should be reversed for the reasons provided above.

D. The Rejection of Claims 1-26 under §112, second paragraph, Should Be Reversed Because the Claims are Supported by the Specification

The Patent Office rejected Claims 1-26 under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In the Final Office Action, the Patent Office states that “the negative limitation reciting that no elastomeric yarns are used in the instant invention is unclear because the only yarn recited in the specification of the instant invention is an elastomeric yarn (GRILON®/LYCRA®).” (See the Final Office Action, page 4). Appellants respectfully disagree with the Patent Office.

As described above, the specification and the claims state that the support yarn and fusible yarn which form the tubular fabric of the present invention do not include an elastomeric yarn. Additionally, the specification states that GRILON® or GRILON® K-85 is a preferred yarn for making the tubular fabric of the claimed invention. Therefore, a yarn including GRILON®/LYCRA® is not the only yarn cited in the specification. Moreover, the specification does not disclose or suggest that a GRILON®/LYCRA® yarn is used by the claimed invention. A person of ordinary skill in the art therefore would clearly know that the claimed invention does not include an elastomeric yarn such as a yarn including LYCRA® based on the specification



and the claims of the above-identified patent application. Therefore, the rejection of Claims 1-26 under §112, second paragraph, should be reversed for the reasons provided above.

E. The Rejection of Claims 1-7, 9-13, 17-19 and 21-26 under 35 U.S.C. § 102(b) Should Be Reversed Because Richardson Does Not Anticipate the Claimed Invention

Claims 1-7, 9-13, 17-19 and 21-26 were rejected under 35 U.S.C. § 102(b) as being anticipated by Richardson. A copy of Richardson is attached as Exhibit C. Applicants respectfully submit that this rejection has been overcome or is improper for the following reasons.

Richardson discloses a tubular fabric for receiving an underwire in a garment such as a bra. The tubular fabric is formed by arranging a fusible yarn on the interior surface of the tube and melting the yarn to coat that surface. The fabric includes an elastomeric yarn and a support yarn. (Emphasis added)(See the Abstract). Therefore, Richardson discloses a tubular fabric having a fusible yarn that includes an elastomeric yarn.

On the contrary, the claims of the present application state that the fabric of the present invention does not include an elastomeric yarn. Therefore, Richardson, which discloses a tubular fabric including elastomeric yarn, does not disclose, teach or suggest the tubular fabric of the present invention which does not include an elastomeric yarn. Accordingly, Richardson does not disclose all of the elements of claims 1-7, 9-13, 17-19 and 21-26. Therefore, claims 1-7, 9-13, 17-19 and 21-26 are patentably distinguished from Richardson and are in condition for allowance.

F. The Rejection of Claims 14-16 Should Be Reversed Because the Patent Office Failed to Establish a Prima Facie Case of Obviousness

Claims 14-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Richardson in view of the '227 application. A copy of the '227 application is attached as Exhibit D. Applicants respectfully submit that this rejection has been overcome or is improper for the following reasons.

Claims 14-16 depend from claim 1. Applicants respectfully submit that claims 14-16 are allowable for at least the reasons set forth above with respect to claim 1 because the combination

of Richardson and the '227 application does not disclose, teach or suggest the novel elements of these claims, in addition to the novel element of claim 1.

Moreover, the combination of Richardson and the '227 application does not teach or suggest the elements of claims 14-16 because there is no motivation to combine these references. The Patent Office states that Richardson teaches certain of the limitations or elements of the claimed invention except for "a heat and pressure treatment to provide certain stretch characteristics to the fabric." (See the Final Office Action, page 5). The Patent Office, therefore, relies on the '227 application to remedy the deficiencies of Richardson. Specifically, the Patent Office states that the '227 application teaches the steps of applying heat and pressure to a fabric to obtain certain stretch characteristics.

As described above, Richardson discloses a tubular fabric which includes an elastomeric yarn. As described in Richardson, elastomeric yarns were considered to be a vital component of tubular fabrics. In fact, Richardson states as follows:

"The tubular fabric comprises an elastomeric yarn to lend the fabric a desirable degree of flexibility or "give". This is important as the fabric must be curved to receive an underwire. If the fabric did not include the elastomeric yarn it would not lie flat when the underwire was in position, making the finished product unappealing aesthetically." (Page 4, lines 28-33). (Emphasis added.)

Accordingly, the invention described in Richardson requires an elastomeric yarn.

The '227 application is directed to a method for imparting stretch to fabrics. The method treats a woven fabric by applying heat and pressure to the fabric. By applying the heat and pressure, the yarn strands substantially across the width of the fabric and thereby forces the fabric closer to together to impart "stretch" to the fabric. Thus, the '227 application includes a method for imparting stretch to non-stretchable fabrics. A person of ordinary skill in the art, therefore, would not employ the method of the '227 application with Richardson to impart stretch to the fabric in Richardson where Richardson already discloses a stretchable fabric (i.e., the fabric including the elastomeric yarn). Additionally, Richardson does not disclose, teach or suggest employing such a method for imparting stretch to a tubular fabric.

Moreover, the fabric disclosed by Richardson relates to inner fabrics or inner garments such as a bra. On the contrary, the '227 application discloses imparting stretch to "non-stretch" outer fabrics. (See page 2, lines 1-5). Therefore, Richardson describes stretchable inner fabrics

where the '227 application is concerned with non-stretchable outer fabrics. Accordingly, a person of ordinary skill in art would not be motivated to combine Richardson with the '227 application where there is no teaching or suggestion in either reference to make such a combination.

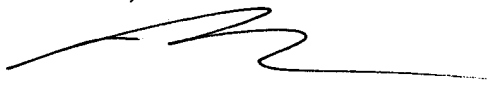
For these reasons, the combination of Richardson and the '227 application does not disclose, teach or suggest the elements of claims 14-16. Therefore, claims 14-16 are patentably distinguished over the combination of Richardson and the '227 application and are in condition for allowance.

### VIII. CONCLUSION

Appellants respectfully submit that the specification and the terminology used in the claims are clearly define and support the claimed invention. Additionally, Appellants respectfully submit that Claims 1-7, 9-13 and 21-26 are not anticipated by Richardson under 35 U.S.C. § 102(b). Moreover, the claimed invention set forth in Claims 14-16 is neither taught nor suggested under 35 U.S.C. §103(a) by the cited combination of references. Thus, the Patent Office has failed to establish a *prima facie* case of obviousness with respect to the rejection of Claims 14-16. Accordingly, Appellants respectfully submit that the rejections of the specification and pending Claims 1-7, 9-19 and 21-26 is erroneous in law and fact and should be reversed by this Board.

Respectfully submitted,

BELL, BOYD & LLOYD LLC



BY

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Date: November 12, 2004

## APPENDIX A

1. A method for making a tubular fabric comprising the steps of:  
forming a support yarn and a fusible yarn into a tubular fabric wherein the fabric does not include an elastomeric yarn; and  
arranging the fusible yarn within the tubular fabric so that when said fusible yarn melts over the tubular fabric, the fabric forms a barrier to penetration by a bra wire upon cooling.
2. A method as claimed in Claim 1 wherein the step of forming the yarns into a tubular fabric is performed by weaving the yarns.
3. A method as claimed in Claim 1 wherein the tubular fabric is selected from the group consisting of open fabric and flat fabric.
4. A method as claimed in Claim 1 wherein the fusible yarn is composed of multifilaments.
5. A method as claimed in Claim 1 wherein the fusible yarn and support yarn are made from a polyamide.
6. A method as claimed in Claim 1 wherein the fusible yarn has a melting point of 75 to 90°C.
7. A method as claimed in Claim 1 wherein the fusible yarn has a melting point of approximately 85°C.
9. A method as claimed in Claim 5 wherein the polyamide yarn is textured.
10. A method as claimed in Claim 9 wherein the polyamide yarn is composed of a plurality of filaments.

11. A method as claimed in Claim 1 further comprising the steps of:  
treating the tubular fabric by heating the fabric whereby the fusible yarn melts and spreads over the interior surface of the tubular fabric; and  
cooling the tubular fabric to allow the melted fusible yarn to adhere to the other yarns of the fabric thereby producing a barrier to penetration by a bra wire.
12. A method as claimed in Claim 11 wherein the step of treating the tubular fabric by heating is performed by a polyamide fabric dyeing process.
13. A method as claimed in Claim 11 wherein the temperature is equal to or greater than 100°C.
14. A method as claimed in Claim 1 further comprising the step of treating the tubular fabric so that the yarn strands substantially across the width of the fabric are forced closer together wherein the tubular fabric is stretchable along the length of the tubular fabric.
15. A method as claimed in Claim 14 wherein the step of treating the tubular fabric includes the application of heat and pressure to the fabric.
16. A method as claimed in Claim 14 wherein the processing temperature is 80 to 200°C.
17. A method as claimed in Claim 11 further comprising the step of locating an underwire within a length of the tubular fabric.
18. A method as claimed in Claim 17 further comprising the step of incorporating the tubular fabric into a garment.

19. A method as claimed in Claim 18 wherein the garment is selected from the group consisting of a bra, a basque and a swimming costume.

21. A tubular fabric comprising a support yarn and a fusible yarn, the fusible yarn being constructed and arranged so that when said fusible yarn melts over the tubular fabric it forms a barrier to penetration by a bra wire upon cooling, wherein the tubular fabric does not include an elastomeric yarn.

22. A tubular fabric as claimed in Claim 21 wherein the fusible yarn is melted.

23. A garment comprising:

a wire; and

a tubular fabric comprising a support yarn and a fusible yarn, the fusible yarn being constructed and arranged so that when said fusible yarn melts and spreads over the tubular fabric it forms a barrier to penetration by the wire upon cooling, wherein the tubular fabric does not include an elastomeric yarn.

24. The garment as claimed in Claim 23, wherein the garment is a bra.

25. The garment as claimed in Claim 23, wherein the garment is a basque.

26. The garment as claimed in Claim 23, wherein the garment is a swimming costume.

## APPENDIX B

<b>Claim 1</b>	<b>Drawings</b>	<b>Specification</b>
A method for making a tubular fabric comprising the steps of:	Figs. 1-8	Page 1, lines 1-3; Page 17, lines 8-15
forming a support yarn and a fusible yarn into a tubular fabric wherein the fabric does not include an elastomeric yarn; and	Figs. 4-8	Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5; Page 26, lines 10-11
arranging the fusible yarn within the tubular fabric so that when said fusible yarn melts over the tubular fabric, the fabric forms a barrier to penetration by a bra wire upon cooling.		Page 2, line 27 to Page 3, line 2; Page 3, lines 19-22; Page 9, line 22 to Page 10, line 3

<b>Claim 21</b>	<b>Drawings</b>	<b>Specification</b>
A tubular fabric comprising a support yarn and a fusible yarn	Figs. 4-8	Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5
the fusible yarn being constructed and arranged so that when said fusible yarn melts over the tubular fabric it forms a barrier to penetration by a bra wire upon cooling,		Page 2, line 27 to Page 3, line 2; Page 3, lines 19-22; Page 9, line 22 to Page 10, line 3
wherein the tubular fabric does not include an elastomeric yarn.	Figs. 1 and 4-8	Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5; Page 13, lines 13-26; Page 26, lines 10-11

<b>Claim 23</b>	<b>Drawings</b>	<b>Specification</b>
A garment comprising:		Page 19, lines 8-12
a wire; and		Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5
a tubular fabric comprising a support yarn and a fusible yarn	Figs. 4-8	Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5
the fusible yarn being constructed and arranged so that when said fusible yarn melts and spreads over the tubular fabric it forms a barrier to penetration by the wire upon cooling,		Page 2, line 27 to Page 3, line 2; Page 3, lines 19-22; Page 9, line 22 to Page 10, line 3
wherein the tubular fabric does not include an elastomeric yarn.	Figs. 1 and Figs. 4-8	Page 2, lines 20-25; Page 5, line 1 to Page 6, line 5; Page 13, lines 13-26; Page 26, lines 10-11



# (12) UK Patent Application (19) GB (11) 2 309 038 (13) A

(43) Date of A Publication 16.07.1997

(21) Application No 9608059.3

(22) Date of Filing 18.04.1996

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(51) INT CL<sup>6</sup>  
D03D 3/02 , A41C 3/00 3/14 , D03D 1/00 , D04B 21/00

(52) UK CL (Edition O )  
D1K K227 K24A10 K24A6 K24A9 K24B2 K381 K386  
K424 K680 K690  
A3V V1B2A V5M1B V5M2B  
U1S S1136

(56) Documents Cited  
GB 2247696 A GB 1512906 A

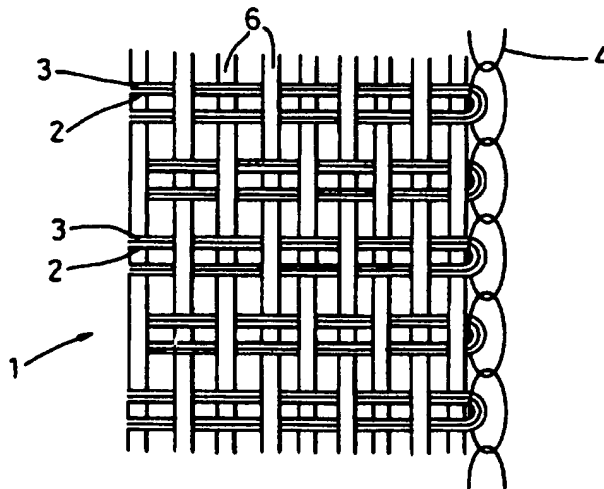
(58) Field of Search  
UK CL (Edition O ) A3V , D1K  
INT CL<sup>6</sup> A41C , A41D , D03D , D04B  
Online: WPI

## (54) Tubular fabric

(57) The present invention relates to a tubular fabric for receiving an underwire in a garment such as a bra. The tubular fabric is formed by arranging a fusible yarn, such as a polyamide, on the interior surface of the tube and melting said yarn to coat the interior surface.

The fabric, which may be woven or warp-knitted, also includes an elastomeric yarn and a support yarn.

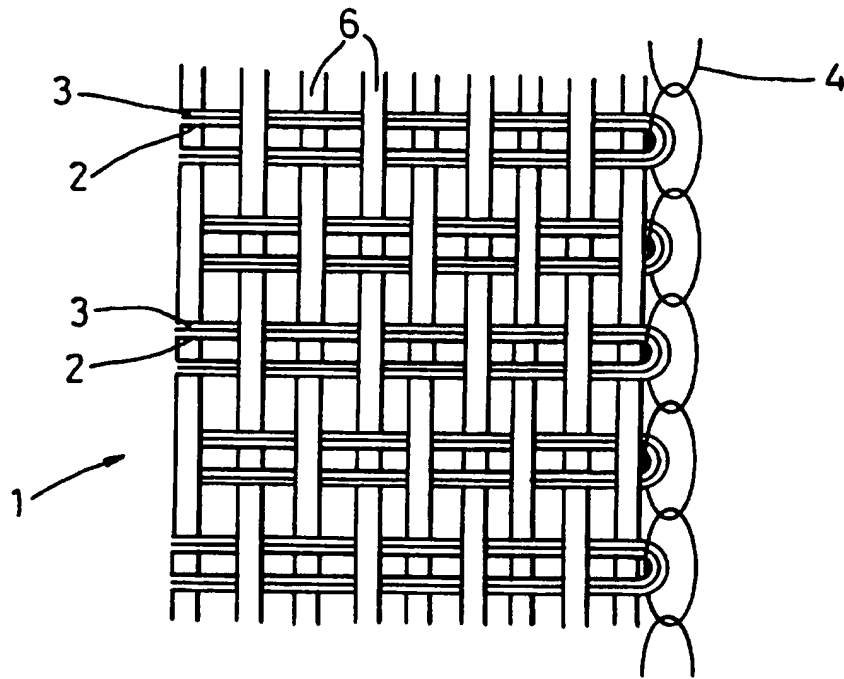
On cooling the melted yarn sets to form a durable lining which exhibits excellent resistance to penetration by underwires.



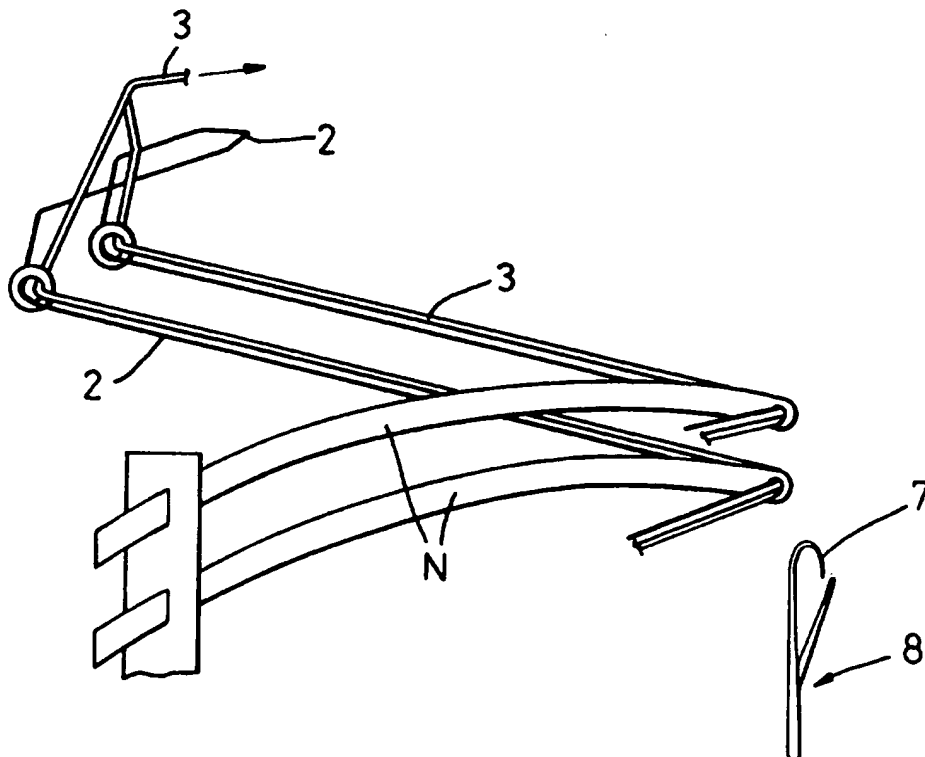
**Fig. 1**

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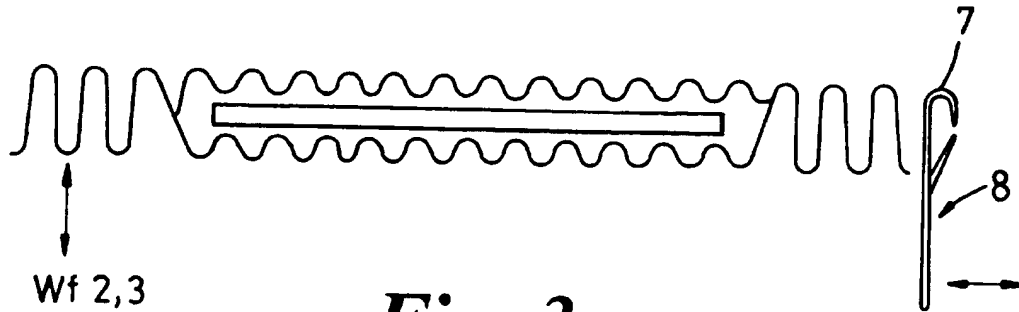
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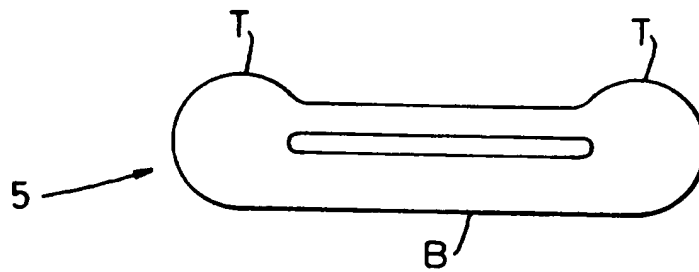
**Fig. 1**



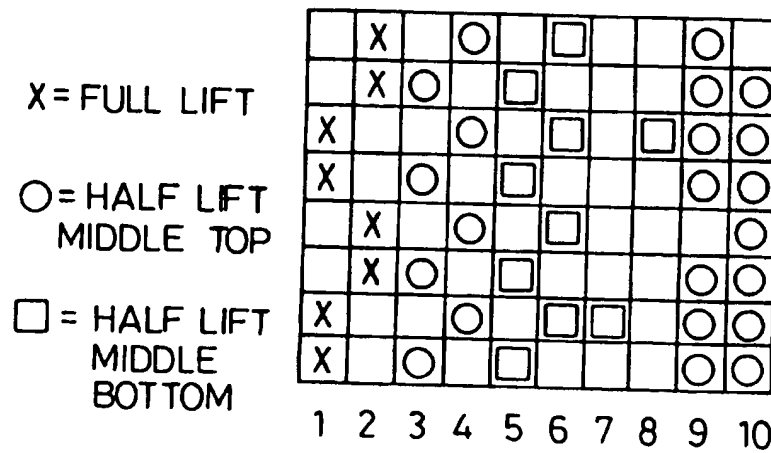
**Fig. 2**



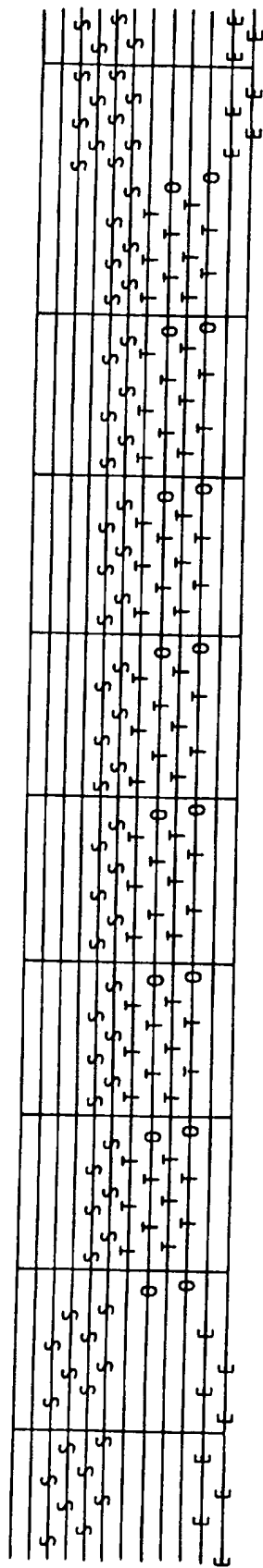
**Fig. 3**



**Fig. 4**



**Fig. 6**



**Fig. 5**

**TUBULAR FABRIC AND METHOD OF MAKING THE SAME**

The present invention relates to a tubular fabric, a method of making the same, and to articles manufactured therefrom, particularly underwired  
5 garments such as brassieres.

It is known to produce fabric tubing for receiving a curved underwire. Conventionally such fabric tubing is made by forming three separate fabric strips. The strips are folded and sewn together to form a tube into which  
10 an underwire can be received.

A considerable problem with known fabric tubing for underwires is that the ends of the underwires can penetrate the tubing, either during the course of garment manufacture or in use by a wearer.  
15

At present, a significant proportion of brassiere (bra) manufacturers products are returned because of protrusion of the underwire through the fabric tubing.

20 Underwire protrusion through the tubing is perhaps most commonly the result of washing the garment such as a bra in a washing machine. Whilst such washing is not presently recommended by garment manufacturers, it is commonplace. Clearly, product failure as a result of underwire protrusion is costly and can have a deterious effect on customer  
25 satisfaction. The present invention seeks to avoid these and other problems of the prior art.

According to the invention there is provided a tubular fabric for receiving an underwire the fabric comprising a support yarn and an elastomeric  
30 yarn; and characterised in that a fusible yarn is arranged on the interior

surface of the fabric tube.

The fusible yarn is a very important feature of the invention.

- 5 By "fusible yarn" we include the meaning that the yarn can be melted at a predetermined temperature and cooled to adhere to the support yarn. Advantageously, the fusible yarn melts at less than 100°C, especially 90°C or less, and can be cooled to produce a material having a higher melting point than the predetermined temperature, and preferably more  
10 than 100°C.

The most preferred fusible yarn for use in the invention is a polyamide yarn, especially that sold by EMS-CHEMIE AG of CH-7013 Domat/EMS, Switzerland under the Registered Trade Mark GRILON.  
15

Advantageously, the fusible yarn is in the form of a multifilament, preferably comprising 14 filaments.

Whilst fusible yarn in the form of monofilaments, such as those produced  
20 by Luxilon Industries in Belgium (under the trade name "Luxilon"), or Toray Industries in Japan, could be used in the present invention, a multifilament yarn is preferred because on melting it spreads more easily over the fabric. In contrast, the melting of a monofilament produces a less even spread which may be less comfortable to a wearer of a finished  
25 garment incorporating the tubular fabric of the invention.

Preferably, the fusible yarn is treated by heating whereby it melts and spreads over the interior surface of the tubular fabric. On cooling, the fusible yarn adheres to the other yarns of the fabric to produce a tubular  
30 fabric having a durable inner lining of the melted fusible yarn.

Preferably, when the fusible yarn is a polyamide the treatment to melt the fusible yarn comprises a conventional polyamide fabric dyeing process.

5 The temperature involved in the dyeing process exceeds the melting point of the fusible polyamide yarn. Conveniently, the fusible polyamide yarn is GRILON having a melting point of 85°C. Typical polyamide dyeing processes reach temperatures of around 100°C.

10 A particular preferred feature of GRILON is that on cooling it retains a melting point "memory" for the temperature reached during the dyeing process ie after the dyeing process its melting point changes from 85°C to 100°C or more. It will be appreciated that this feature confers the important advantage that the tubular fabric product will not deteriorate on washing by a user in a washing machine because the "new" melting point  
15 of the melted fusible yarn will not be reached during normal washing.

A skilled person will understand that a fusible yarn of the invention is intended to include any yarn which can melt at a predetermined temperature and adhere to other yarns of the fabric. On cooling, the  
20 melted fusible yarn preferably produces a coating which has a temperature in excess of the predetermined temperature and preferably in excess of 100°C.

The tubular fabric comprises an elastomeric yarn to lend the fabric a  
25 desirable degree of flexibility or "give". This is important as the fabric must be curved to receive an underwire. If the fabric did not include the elastomeric yarn it would not lie flat when the underwire was in position, making the finished product unappealing aesthetically. A skilled person will appreciate that a range of elastomeric yarns could be employed.  
30 However, an elastane eg Lycra (Registered Trade Mark) is preferred both

for its well proven performance and widespread commercial acceptance. A particularly preferred lycra yarn is distributed by Wykes of Leicester, England under their product code S540 and comprises a core of 235 decitex (dtex) Lycra (Du Pont) covered on top by 1 fold 78 dtex textured  
5 18 filament Nylon 6 (Du Pont) and on the bottom by 1 fold 78 dtex textured 18 filament Nylon 6 (Du Pont).

Preferably, the support yarn is a polyamide, especially a textured polyamide. The support yarn is preferably composed of multifilaments.  
10 Preferred support yarns include Nylon 6 or Nylon 66 sold by Du Pont which comprises a 20 filament textured polyamide yarn.

It is preferred that the fusible yarn and the support yarn are composed of the same material, advantageously a polyamide, so that they can be  
15 adhered to one another easily and so that their respective dyeing properties will be the same. A uniformity of dyeing throughout the fabric of the invention is an important commercial and aesthetic consideration.

The term "underwire" is intended to include any substantially rigid  
20 structural member and it need not be made from a metal. For example, a structural member formed from a substantially rigid plastic or from bone may be preferred in certain garments incorporating the tubular fabric of the invention. Such structural members are intended to fall within the scope of the term "underwire" as used herein.

25

In a further aspect the invention provides a method for making a tubular fabric for receiving an underwire comprising providing a support yarn and an elastomeric yarn;

characterised in that a fusible yarn is also provided and the yarns  
30 are formed into a tubular fabric whereby fusible yarn is arranged on the



interior of the fabric surface.

Preferably, the yarns are formed into a tubular fabric by a weaving process. Whilst the tubular fabric can also be formed by a knitting  
5 process, a weaving process is preferred because, in general, weaving produces a denser fabric than an equivalent knitting process. Also, a knitted fabric is typically less comfortable than a woven fabric due to its more open structure.

10 The fabric tubing is preferably formed by weaving two fabric tapes. The tapes are overlaid and their edges joined by edge threads, rising from the bottom tape to the top tape and *vice versa*.

Each tape preferably has two weft threads (one being fusible yarn and the  
15 other support yarn) inserted by one needle and knitted by a catch thread onto a latch needle.

It is possible to make a similar tubular fabric using a single weft needle. However, the production rate would be reduced significantly in  
20 comparison to the rate possible with a double weft needle. This is because the single needle would require approximately twice the number of picks to produce a fabric having the same strength as that produced by a double needle.

25 The weaving operation can be performed using a conventional narrow fabric loom. A preferred loom is produced by Jakob Müller AG, of Frick CH-5070 Frick, Switzerland and is known as Model Müller NF 6/27, and is fitted with a Müller NF system 3 catch thread attachment.

30 Preferably, threads are woven more loosely on one side (bottom) and the

edges of the other side (top) to produce "soft" surfaces for increased comfort to a subsequent wearer.

Preferably the yarns are textured for improved comfort and low shrinkage properties. Advantageously, the yarns are composed of multifilaments.

A particularly preferred polyamide yarn is 2 fold 78 dtex textured Nylon 6 or Nylon 66 comprising 20 air mingled filaments. These yarns are available from Du Pont.

10

Preferably, the fusible yarn is 1 fold 75 dtex 14 filament GRILON K-85, available from EMS, Switzerland.

Preferably the fabric further comprises a catch thread which serves to make a smaller softer knitted edge. Conveniently, the catch thread comprises 1 fold 44 dtex air mingled 13 filament textured Nylon 6 or Nylon 66 (Du Pont).

A skilled person will appreciate that the term decitex (dtex) refers to the thickness of the yarn. Yarns having a lower dtex than the preferred dtex mentioned above would produce a thinner fabric which may be less comfortable to wear. Yarns with a higher dtex would produce a thicker fabric which may be less flexible.

In the finished fabric weight the percentages of the different yarns are preferably in the ranges:-

- (i) fusible yarn 5 - 15 %, especially approximately 8 %
- (ii) Elastomeric yarn 0.5 - 10 %, especially 1-2 %
- (iii) catch thread less than 1 %
- (iv) support yarn - balance to give 100 %

If monofilament yarn is used for the fusible yarn, more yarn may be required to achieve satisfactory spreading, and the preferred range is from 5-20%, especially approximately 10%.

- 5 Preferably, the method of the invention comprises a further step of treating the tubular fabric by heating to melt the fusible yarn so that it spreads over the interior of the tubular fabric. On cooling, the melted yarn adheres to the other yarns of the fabric to form a durable inner tube lining.

10

Advantageously, when the fusible and support yarns are polyamide the treatment comprises a conventional polyamide fabric dyeing process which involves temperatures in excess of the melting point of the fusible yarn.

- 15 The preferred fusible polyamide yarn is 1 fold 75 dtex 14 filament Grilon yarn, which has a predetermined melting point of approximately 85°C.

Dyeing can be achieved using a continuous pad/steam process, or by a batch process. In both methods the process is preferably controlled so that  
20 the temperature does not fall below a predetermined temperature which is in excess of the melting point of the fusible yarn. The dyeing temperature is typically 100°C or more.

After dyeing, the dyed fabric tubing is dried and cooled.

25

Conveniently, the fabric can be further treated with a normal dyed fabric finishing step such as acid treatment (using citric acid) to reduce the pH of the finished fabric to less than 4 and thereby protect the fabric from phenolic yellowing which can arise if the fabric is exposed to nitrogen  
30 oxide fumes.

The fabric tubing produced in accordance with the invention has a durable inner lining of fusible yarn which is extremely resistant to penetration by underwires.

- 5 Independent tests conducted by Inchcape Testing Services of England have demonstrated that the fabric tubing of the invention is over twice as resistant to underwire penetration as conventional fabric tubing and retains this resistance after repeated washing in a tumble drier at 50°C. In contrast to known fabric tubing, the advantageous resistance to penetration  
10 property of the fabric tubing of the invention makes it well-suited for use in underwired garments intended for machine rather than hand washing. in contrast to known fabric tubing.

Preferred embodiments of the invention will now be described by way of  
15 non-limiting examples, with reference to the following drawings in which:-

Figure 1 is a plan view showing a fabric tape produced according to a preferred weaving method of the invention;

20 Figure 2 shows the weft yarns, weft needles and the catch thread latch needle used in the preferred weaving method;

Figure 3 shows the weft paths in the fabric;

Figure 4 is an end view of fabric tubing according to the invention;

Figure 5 shows the drawing in and front reed plan for weaving  
25 fabric tubing in accordance with a preferred method of the invention; and

Figure 6 shows the Heald frame lifting plan for weaving a fabric tubing in accordance with the invention.

The preferred fusible polyamide, Grilon K-85 (Registered Trade Mark),  
30 has a melting point of approximately 85°C and a preferred yarn count dtex

of 75. According to the manufacturer's technical data sheet Grilon K-85 has the following properties:-

	Melting range	78-88°C	(172-190°F)
5	Application temperature range	95-120°C	(203-248°F)
	Melt viscosity DIN 53735, 160°C/21.6N		900 Pa.s
	Yarn count	75 dtex	14 filaments
	Tenacity	28 cN/tex	
	Elongation at break	40- 70%	
10	Twist	300Z T/m	
	Wash resistive	40°C	
	Dry cleaning resistance	PER-Chloro resistant	

#### 1. Formation of Tubular Fabric

15

As shown in Figure 1, a preferred fabric tubing 1 of the invention comprises textured polyamide 2 and Grilon 3 weft threads Wf and polyamide warp threads 6 woven into two tapes which are overlaid and their edges joined by edge threads 4, rising from the bottom tape to the  
20 top tape and *vice versa*, to form a tube 5.

Each tape has its two weft threads Wf inserted by one needle N and knitted by a catch thread 7 onto a latch needle 8. Threads are preferably woven more loosely onto one side (bottom) B and the edges of the other  
25 side (top) T to give the fabric tube a soft feel to a wearer, as shown in Figure 4.

The tubular fabric is preferably produced using a Müller model NF 6/27 Narrow Fabric Loom fitted with a catch thread attachment (Müller NF  
30 System 3).

The loom includes twelve Heald frames. To produce each tape of fabric 2 weft needles, a catch thread attachment, 4 weft thread feeds and 4 weft thread stop motions (designed to stop the machine should the weft thread break) are employed.

5

As shown in Figure 2 a double weft needle is used, with each needle B carrying two weft threads 2, 3.

The loom settings are within the general knowledge of skilled person and  
10 are as set out in the relevant manufacturer's operation manual.

**Table 1**

	<b>MATERIAL COMPOSITION</b>		<b>YARN</b>	<b>COLOUR</b>
	<b>Beam Ends</b>		<b>fold/dtex/ No.filament</b>	
5	S = Soft Face	1 x 74	2/78/20 Textured Nylon Air Mingled	White
	T = Tube	1 x 70	2/78/20 Texture Nylon Air Mingled	White
	E = Edge	1 x 16	2/78/20 Textured Nylon Air Mingled	White
	O = Elastomeric	1 x 16	S 540 (Wykes)	White
	Catch thread	1	1/44/13 Textured Nylon Air Mingled	White
10	Weft	2	2/78/20 Textured Nylon Air Mingled	White
	Weft	2	1/75/14 Non - Textured Grilon K85	White
	Reed Per cm	10/8	Per 1" 26/8	
	Picks Per cm	13 to 19.5	Per 1" 33-50	
	Elongation	25%		
15	m/c Width	10 mm		
	m/c Elongation	20%		

Figures 5 and 6 show a drawing in and reed plan and the Heald frame lifting plan to be followed to produce a preferred tubular fabric from the materials given in Table 1, by a weaving process according to the invention.

As mentioned previously, the tubular fabric could be produced by a knitting process employing a known fine gauge multi-bar warp or crochet knitting machine.

- 5 The preferred method of the invention produces a tubular fabric comprising a polyamide yarn, an elastomeric yarn and a fusible polyamide yarn, preferably Grilon K-85, arranged on the interior surface of the fabric tube. Whilst such a product may be a valuable commercial product in itself, it is preferably subjected to a further heat treatment step to  
10 provide a durable lining of fused polyamide on the interior surface of the fabric tubing.

## **2. Heat Treatment to Form Durable Tube Lining**

- 15 In the preferred method the heat treatment step is carried out by a conventional polyamide dyeing process. The batch dyeing process is preferred when the fabric is to be dyed with dark colours such as red, black or blue, whereas the continuous dyeing process is preferred for whites, creams and pastel colours.

20

2. (i) A suitable continuous pad-steam dyeing process of the invention can be carried out with a conventional dyeing machine such as a MAGEBA (Registered Trade Mark) Pad Steamer range produced by MAGEBA Textile machines GMBH & Co.

25

- Preferably the conventional device is modified by the addition of a temperature sensing means which monitors the temperature within the dyeing machine. If the temperature falls below a predetermined level eg 90°C (in excess of the melting point of the fusible Grilon yarn, an  
30 indicator such as a flashing light or buzzer is activated to warn an operator



so that appropriate action can be taken to increase the temperature, as required.

Undyed tubular fabric of the invention is fed, at a rate of approximately  
5 15 metres per minute, into the dye padding unit of the dyeing machine  
which utilises a conventional polyamide dye (eg available from Hoechst,  
Ciba-Geigy and Sandoz etc). The fabric then passes into the atmospheric  
steamer unit where the fusible Grilon yarn melts. The fabric is then  
passed into excess dye wash off baths, size tanks and into drying cylinders  
10 (eg a drying unit sold by Mageba).

Throughout the process the fabric is maintained under a fixed tension by  
means of appropriately positioned automatic dancer arms.

15 The fabric residence time in the steamer unit is 2-3 minutes, preferably  
2.75 minutes at a temperature of from 100-105°C. The tubular fabric is  
dried uniformly whilst controlling the tension of the fabric so that the  
dimensional stability of the fabric is optimised.

20 2. (ii) In the batch drying process a known Pegg Pulsator can be  
used. This machine comprises a stainless steel tank in which a dyeing  
solution can be heated and stirred.

Fabric to be dyed is assembled into 50 metre hanks tied loosely with string  
25 bands. The hanks are put into a dyeing solution and heated until the  
solution boils (which melts the Grilon K-85 yarn). Boiling is preferably  
continued for at least approximately 45 minutes. The dyed fabric hanks  
are then removed from the tank, rinsed and dried.

30 A temperature control is used to warn the operator if the temperature falls

below 90°C during the boiling step.

The tubular fabric of the invention is particularly suitable for receiving underwires and is useful in the manufacture of a range of underwired garments including bras, basques and swimming costumes.

The following tests demonstrate the increased resistance to penetration afforded by the tubular fabric of the invention compared to known fabric tubing for receiving underwires.

10

3. The penetration force through the fabrics was measured using a strain gauge on a L + M Sewability Tester with a 90's medium ball needle to represent an underwire. The various component fabrics were pushed over the needle and the force required to penetrate the fabric was measured.

15

Various fabric thicknesses were measured as follows:-

A) White Woven Fabric Tube produced according to the invention.

20

- 1) The fabric was split open
- 2) Each side was tested

B) Conventional White Warp Knitted Fabric Tube for underwires

25

- 1) Single thickness outer fabric
- 2) Single thickness inner fabric
- 3) Double thickness inner tube

**Results**      Original (unwashed) penetration force

A1    200g Plain

A2    300g Brushed

B1    40 g

5    B2    50g

B3    120g

After repeated washing @ 50°C Tumble Dry

<b><u>Results</u></b>	1st	2nd	3rd	4th	5th	6th
10    A1 (Plain)	230g	210g	200g	200g	200g	200g
A2 (Brushed)	340g	300g	280g	270g	270g	270g
B1	30g	40g	30g	50g	50g	60g
B2	40g	40g	60g	70g	60g	70g
B3	100g	90g	80g	80g	80g	90g

15

Comparing the forces required to penetrate A2 B2 and B3, it is clear that the fabric of the invention is two or three times more resistant to penetration than a known fabric used for receiving underwires in bras.

## **CLAIMS**

1. A method for making a tubular fabric comprising providing a support yarn and an elastomeric yarn; characterised in that a fusible yarn  
5 is also provided and in that the yarns are formed into a tubular fabric whereby the fusible yarn is arranged on the interior surface of the fabric tube.
2. A method as claimed in Claim 1 wherein the yarns are formed into  
10 a tubular fabric by weaving.
3. A method as claimed in Claim 1 or 2 wherein the fusible yarn is composed of multifilaments.
- 15 4. A method as claimed in any one of Claims 1 to 3 wherein the fusible yarn and/or support yarn are made from a polyamide.
5. A method as claimed in any one of Claims 1 to 4 wherein the fusible yarn has a melting point of from 75 to 90°C.  
20
6. A method as claimed in any one of Claims 1 to 5 wherein the fusible yarn has a melting point of approximately 85°C.
7. A method as claimed in any one of Claims 1 to 6 wherein the  
25 fusible yarn is a polyamide yarn which has substantially the same properties as the yarn known as Grilon K-85.
8. A method as claimed in any one of Claims 1 to 7 wherein the elastomeric yarn is an elastane.

30

9. A method according to Claim 8 wherein the elastane is known as Lycra.

10. A method according to Claim 8 or 9 wherein the elastomeric yarn  
5 is covered with a polyamide yarn.

11. A method as claimed in any one of Claims 4 to 10 wherein the polyamide yarn is textured.

10 12. A method as claimed in Claim 11 wherein the polyamide yarn is composed of a plurality of filaments.

13. A method as claimed in any one of Claims 1 to 12 further comprising the step of treating the tubular fabric by heating whereby the  
15 fusible yarn melts and spreads over the interior surface of the tubular fabric, and subsequently cooling the fabric to produce a tubular fabric having melted yarn adhered to its interior surface.

14. A method as claimed in Claim 13 wherein the treatment by heating  
20 comprises a polyamide fabric dyeing process.

15. A method as claimed in claim 13 or 14 wherein the temperature is 100°C or more.

25 16. A method as claimed in Claim 13, 14 or 15 further comprising the step of locating an underwire within a length of the tubular fabric.

17. A method as claimed in Claim 15 further comprising the step of incorporating the tubular fabric into a garment before or after the  
30 underwire is located.

18. A method as claimed in Claim 17 wherein the garment is selected from a bra, a basque or a swimming costume.
19. A tubular fabric comprising a support yarn and an elastomeric yarn;  
5 and characterised in that a fusible yarn is arranged on the interior surface of the fabric tube and is obtainable by the method of any one of Claims 1 to 16.
20. A tubular fabric comprising a support yarn and an elastomeric yarn;  
10 and characterised in that a fusible yarn is arranged on the interior surface of the fabric tube.
21. A tubular fabric as claimed in Claim 19 wherein the fusible yarn has been melted over the interior surface of the fabric tube.  
15
22. A method of making a tubular fabric substantially as described herein with reference to one or more of Figures 1 to 6.
23. A tubular fabric substantially as described herein with reference to  
20 one or more of Figures 1 to 6.



Application No: GB 9608059.3  
Claims searched: 1-26

Examiner: Alexander Littlejohn  
Date of search: 20 December 1996

**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Int CI (Ed.6): A41C; A41D; D03D; D04B

Other: Online: WPI

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
A	GB2247696A (Meadox) see e.g. page 7 lines 5-28	-
A	GB1512906 (Delet) see e.g. page 1 line 93 - page 2 line 13	-

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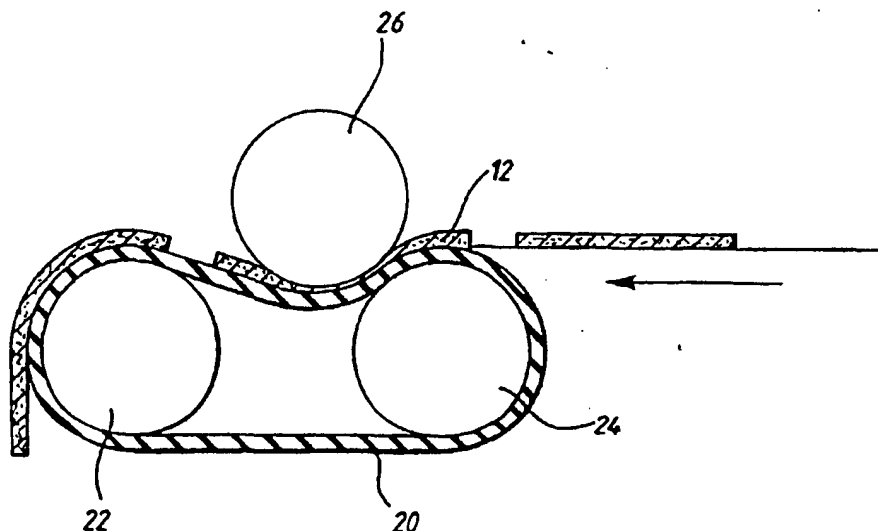
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(21) International Application Number: <b>PCT/GB94/01079</b> (22) International Filing Date: <b>19 May 1994 (19.05.94)</b> (30) Priority Data: 9310707.6                      21 May 1993 (21.05.93)                      GB 9321124.1                      13 October 1993 (13.10.93)                      GB (71)(72) Applicant and Inventor: <b>MORRIS, David, Eric [GB/GB];</b> <b>Larkrise, Cragg Wood Drive, Rawdon, Leeds LS19 6LG</b> <b>(GB).</b> (74) Agent: <b>WHARTON, Peter, Robert; Urquhart-Dykes &amp; Lord,</b> <b>Inventions House, Valley Court, Canal Road, Bradford BD1</b> <b>4SP (GB).</b>		(81) Designated States: <b>AU, BB, BG, BR, BY, CA, CN, CZ, FI, GE, HU, JP, KG, KP, KR, KZ, LK, LV, MD, MG, MN, MW, NO, NZ, PL, RO, RU, SD, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</b>  <b>Published</b> <i>With international search report.</i> <i>Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i>

(54) Title: IMPARTING STRETCH TO FABRICS



## (57) Abstract

A method of treating a woven fabric includes applying heat and pressure to the fabric (12) in such a manner that the yarn strands substantially "across" the width of the fabric are forced closer together thus imparting generally semi-permanent or permanent "ease" or "stretch" into the fabric. Apparatus for carrying out this process is also disclosed, as well as a waistband construction utilising the treated fabric.



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### IMPARTING STRETCH TO FABRICS

The present invention relates to a process for treating fabric and to a fabric construction system, particularly though not exclusively, for application in clothing manufacture, which enables a certain degree and type of stretch to be imparted into, for example, a waistband, which hitherto has not been achieved.

Conventionally, waistband interlining can be elasticated and the outer fabric of the waistband "ruched" or "gathered", providing for a large degree of stretch whilst compromising the "tailored" look and fit of the garment to which such an elasticated waistband is attached; or comprises a "non-stretch" interlining which acts as a stiffener stabilising the outer fabric, affording some degree of reinforcement and perhaps providing added resilience.

The disadvantage of the latter system of construction is that there is little "give" or "ease" in that area of the garment incorporating the waistband, and the fit of the garment may become uncomfortable to the wearer, for example after meals when the waist expands; in prolonged wear the top of the waistband can be forced to "give way" and effectively "roll over" rendering the look of the garment unsightly. In addition a wearer falling mid way between sizing of "off the peg" waistbanded garments selects a garment which is either too tight or too loose in normal wear.

Relatively recently waistbands incorporating a combination of interlinings, linings and outer fabrics, although not necessarily all three components, which have inherent "give" or "ease" and provide a degree of "stretch" have been produced and sold in trousers and skirts. Waistbands incorporating "stretch" fabrics for example those containing "Lycra" or "Elastane", and/or those referred to as "weft stretch", in some cases achieve a satisfactory level of comfort.

-2-

The present invention is therefore concerned primarily with consistently achieving "ease" and comfort using conventional "non-stretch" outer fabrics, for example those where the inherent characteristic in the length or width of the material does not have a sufficient degree of "ease" or "stretch" to enable a "stretch" waistband to be produced with conventional methods. Some examples of such fabrics include woven or knitted combinations of polyester/wool, polyester/viscose, cotton etc.

According to a first aspect of the present invention there is provided a method of treating a woven fabric, the method including applying heat and pressure to the fabric in such a manner that the yarn strands substantially "across" the width of the fabric are forced closer together thus imparting generally semi-permanent or permanent "ease" or "stretch" into the fabric.

It is intended that the fabric so treated would be an outer fabric, but the process can also be applied to lining or interlining fabrics.

The fabric treated may be in full width form, but typically the fabric (e.g. an outer fabric) is cut into strips either down the length of the piece (i.e. in the "warp" direction - where continuous strips may be used) or at right angles across the piece (i.e. in the "weft" direction). This provides the "classic" tailored look in the finished waistband. If it is desired to achieve a higher degree of "stretch" the fabric may be cut at a predetermined angle to the warp or weft direction which will create additional "ease" in the strip dependent on the angle of "bias" selected, but will compromise the traditional look and would be unacceptable in fabrics with a check pattern for example.

Naturally, if the strips are cut at right angles across the piece (i.e. in the "weft" direction), the reference made herein

-3-

to the strands substantially "across" the width of the fabric should be interpreted as meaning the strands substantially "across" the width of the strip.

The strips may be discrete strips or may be continuous strips or reels of fabric, the latter option permitting higher process efficiency to be achieved although this is not always practical from a design viewpoint or necessarily cost effective in cloth utilisation terms.

Typically the outer fabric strip, having had imparted thereto generally semi-permanent or permanent "ease" or "stretch" in accordance with the method of the present invention, has affixed thereto, for example by fusing with adhesive, a selected interlining and/or interlining combination which has the inherent "stretch" required. Interlining selections could include "elastic" types where the degree of "stretch" is known as well as the recovery performance during prolonged wear.

The interlining/s may be woven, woven biased; knitted; non-woven; web adhesives or any other suitable material which, when fused, will maintain the stretch and recovery properties imparted to the outer fabric during the treatment of the present invention. In some cases the treatment stage is sufficient in itself to enable "stretch" to be imparted and retained without the need for interlining attachment in the construction.

Where an interlining is affixed to the treated outer fabric, the fused strip may optionally be further processed, for example it may be fed through an overlock machine to eventually provide for a "curtain" finish or be sewn to a pre-formed stretch/bias lining or "lining composite".

A "lining composite" may be manufactured according to the present invention by subjecting a "non-stretch" lining fabric, for example woven polyester/cotton to the heat and pressure

-4-

treatment specified as being in accordance with the first aspect of the invention, whereby stretch is imparted to the lining fabric. A suitable interlining fabric is fused to the pretreated lining fabric, the interlining fabric being such that, when fused, it will maintain the stretch and recovery properties of the lining fabric imparted by the treatment of the present invention. This provides a "lining composite" which has the desired "stretch" characteristic - this process has the advantage of avoiding "bias" sewing costs involved in conventional "lining composite" production and enables a wider range of fabrics to be utilised in the lining of trousers or skirts. Typically the lining fabric would be in the form of a continuous reel, to provide a continuous "lining composite".

The method of the present invention may conveniently be carried out by machine, and according to the second aspect of the present invention there is provided fabric treatment apparatus comprising means for applying heat and pressure to a woven fabric and transport means for effecting relative movement between said heat and pressure application means and said fabric whereby passage of the fabric through the apparatus results in the yarn strands substantially "across" the width of the fabric being forced closer together thus imparting semi-permanent or permanent "ease" or "stretch" into the fabric.

The apparatus preferably includes means for handling continuous reels of fabric (if used). In the case of continuous reels an operator would be required to load the reels, whereas with individual strips an operator is required to locate each individual strip in a similar type operation to the placement of strips in a conventional waistband fusing operation.

Typically, the apparatus comprises a rubberised conveyor belt in close proximity to a heated steel roller, the strip passing along the belt and being "nipped" under the roller where both pressure and heat is applied progressively to the whole of the length of the strip or reel as the fabric progresses through

-5-

the apparatus.

Preferably, the settings for the temperature and pressure of the steel roller, and the speed of the rubberised conveyor belt are pre-selected for one particular run or series of runs, but some or all of these settings can be variable dependant upon the degree of "stretch" required and the nature or composition of the material being processed. The apparatus preferably includes means for optional steaming, water mist or similar "damping" of the fabric prior to the "nip" to aid the process.

During the process the yarn strands disposed at right angles to the direction of the rubber conveyor or at least substantially "across" the width of the strip are forced closer together. The extent to which the "closing up" occurs for example may be dependant upon machine settings, hygral conditions, inherent thermal yarn shrinkage, the "set" of the fabric, etc.

On exiting from this apparatus the fabric strip has been treated in such a way as to impart generally semi-permanent or permanent "ease" or "stretch" into the fabric.

Where the apparatus is used to treat strips of outer fabric or lining fabric, the apparatus preferably encompasses means for fusing interlining/s to the treated fabric. This may be either "in line" with the main apparatus or integral therewith, or alternatively the treated strip may be fused with interlining/s by passage through a conventional waistband fusing system.

According to a third aspect of the present invention there is provided a woven fabric having "ease" or "stretch" imparted thereto by the method of the first aspect of the present invention.

According to a fourth aspect of the present invention there is provided a waistband incorporating outer fabric and/or lining fabric and/or interlining fabric treated in accordance with the

-6-

first aspect of the present invention.

Whilst the fabric or fabric composite produced in accordance with the present invention having "stretch" potential is primarily intended to be incorporated in a waistband around the waists of garments such as trousers or skirts, the product could also be utilised for any other part of a garment where its benefits would be advantageous, for example to provide "ease" around cuffs, pocket mouths, trouser bottoms, sleeve heads etc. It could also have wider applications to textile articles other than garments, where "stiffening" or reinforcing with a certain degree of "stretch" is required.

Many other applications are also envisaged, for example tapes produced for seam sealing in, for example, the manufacture of waterproof outergarments. Conventionally, tapes for this purpose have to be cut on the bias in order to have sufficient stretch, whereas using a tape made from fabric treated according to the present invention has "stretch" or "ease" built in and therefore removes the need for biasing.

Embodiments of the present invention will now be described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 illustrates the preparation of outer fabric strips,

Figure 2 is a schematic drawing of the machine process,

Figure 3 illustrates strands drawing closer together,

Figure 4 illustrates interlining/s being fused to the strips,

Figures 5 & 6 illustrate respectively the construction of

-7-

a "lined waistband" and its attachment to a garment,

Figures 7 & 8 illustrate respectively the construction of a "cloth waistband" and its attachment to a garment, and

Figure 9 illustrates the bottom of the outer fabric "composite" being overlocked to eventually provide a "curtain finish".

Referring to Figure 1 an outer fabric 10 is cut into strips 12, 14 either across the fabric (12) or down the length of the fabric (14). Alternatively, in Figure 1A, a continuous strip or reel 16 is cut down the length of the fabric, from the roll 18. The fabric may alternatively be treated in the full width form.

As can be seen in Figure 2, the apparatus according to the invention comprises a rubberised conveyor belt 20 driven by conveyor rollers 22, 24, and a heated roller 26 which is held against the belt 20 in closed proximity to roller 24, so as to apply heat and pressure to a fabric strip 12 passing through the nip formed between rollers 26 and 24. The strips are placed onto the conveyor by the operator - the fabric strip direction being at right angles to the heated roller. The strip is progressed through the nip of the roller and rubberised conveyor.

The result of this treatment is to force the strands which pass substantially across the width of the strip to draw closer together, as shown in Figure 3 (Figure 3(i) is before treatment, Figure 3(ii) is after treatment).

As shown in Figure 4, fusible interlining 28 is introduced and fused to the treated outer fabric strips 12 - this operation can be performed "in-line" with the apparatus shown in Figure 2, using a hot air applicator 34 which directs hot air into the nip between two rollers 32, 30. The result is a strip 12A



-8-

which comprises a treated outer fabric strip 12 fused with interlining 28. One particularly suitable fusible interlining is reference number 010 LC from Lainiere de Picardie. Alternatively, a conventional waistband fusing system can be utilised to carry out this step.

Referring to Figure 5, a lined waistband may be created when the outer fabric fused composite 36 at least part of which has been treated according to the present invention and comprising an outer fabric 36A, a fusible carrier 36B and a stiffener 36C is sewn along sewing line 40 to a lining or "lining composite" 42 comprising a lining fabric 42A and a fusible interlining 42B (the lining composite is generally supplied in a continuous reel form to the clothing manufacturer). The "outer fabric fused composite" 36 may then be folded along the edge of the stiffener 36C or along slots provided in the carrier thereby setting the lining or "lining composite" back from the edge of the made up waistband, as illustrated in Figure 6. The assembly is then stitched together along sewing lines 44, 46.

Referring to Figures 7 & 8, a "cloth waistband" may be created by folding the outer fabric fused composite 36, at least one of the components of which has been treated in accordance with the present invention, in half, either along the edge of the stiffener (if one has been used) or by folding along the slots in the fusible interlining (if provided); the unfinished edges are folded under and attached to the outer and inner sides of the garment as shown in Figure 8, being secured along sewing lines 48, 50.

Optionally, the "outer fabric fused composite" 36 can be overlocked along one edge 52 by an overlock sewing machine as shown in Figure 9, to provide a "curtain finish" to the cloth waistband 54.

-9-

CLAIMS

1. A method of treating a woven fabric, the method including applying heat and pressure to the fabric in such a manner that the yarn strands substantially "across" the width of the fabric are forced closer together thus imparting generally semi-permanent or permanent "ease" or "stretch" into the fabric.
2. A method according to Claim 1 wherein the fabric to be treated is cut into strips either down the length of the piece or at right angles across the piece.
3. A method according to Claim 2 wherein the strips are either discrete strips or continuous strips or reels of fabric.
4. A method according to any of the preceding Claims wherein the fabric is an outer fabric which, having had imparted thereto generally semi-permanent or permanent "ease" or "stretch" in accordance with the Claim 1, has affixed thereto, for example by fusing with adhesive, a selected interlining and/or interlining combination which has the inherent "stretch" required.
5. A method according to Claim 4 wherein the interlining is selected from "elastic" types of interlining.
6. A method according to Claim 4 or Claim 5 wherein the fused strip is further processed by feeding through and overlock machine.
7. A method according to Claim 4 or Claim 5 wherein the fused strip is further processed by being sewn to a pre-formed stretch/bias lining or "lining composite".
8. A method according to Claim 7 wherein the "lining composite" is manufactured by subjecting a "non-stretch" lining fabric to the heat and pressure treatment according to Claim 1

-10-

whereby stretch is imparted to the lining fabric, and then fusing this to a suitable interlining fabric, which, when fused, will maintain the stretch and recovery properties of the lining fabric imparted during the treatment according to Claim 1, thus providing a "lining composite" which has the desired "stretch" characteristic.

9. Fabric treatment apparatus comprising means for applying heat and pressure to a woven fabric and transport means for effecting relative movement between said heat and pressure application means and said fabric whereby passage of the fabric through the apparatus results in the yarn strands substantially "across" the width of the fabric being forced closer together thus imparting semi-permanent or permanent "ease" or "stretch" into the fabric.

10 Apparatus according to Claim 9 wherein the apparatus includes means for handling continuous reels of fabric.

11. Apparatus according to Claim 9 or Claim 10 wherein the apparatus comprises a rubberised conveyor belt in close proximity to a heated steel roller, the strip passing along the belt and being "nipped" under the roller where both pressure and heat is applied progressively to the whole of the length of the strip or reel as the fabric progresses through the apparatus.

12. Apparatus according to Claim 11 wherein the settings for the temperature and pressure of the steel roller, and the speed of the rubberised conveyor belt are pre-selected for one particular run or series of runs, but some or all of these settings can be variable dependant upon the degree of "stretch" required and the nature or composition of the material being processed.

13. Apparatus according to any of Claims 9 to 12 wherein the apparatus includes means for optional steaming, water mist or

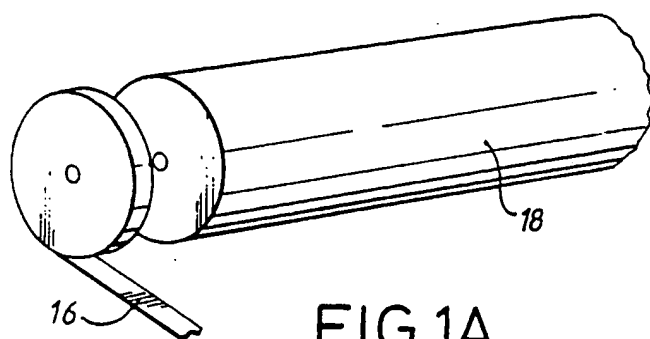
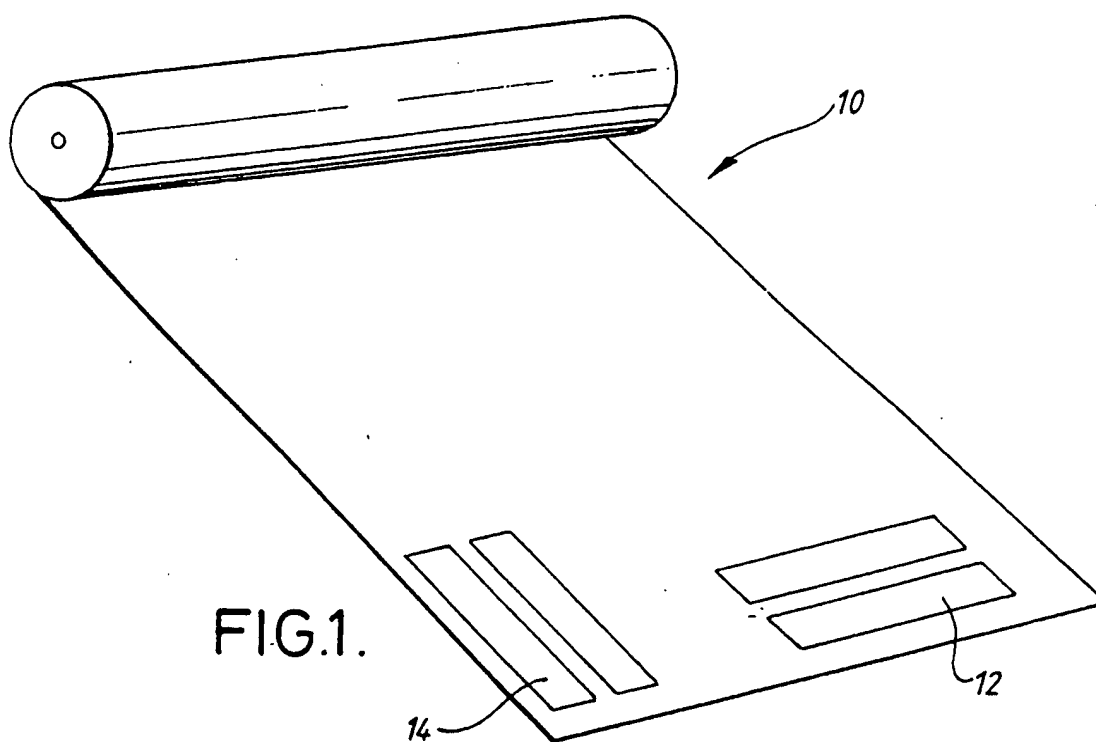
-11-

similar "damping" of the fabric prior to the "nip" to aid the process.

14. A woven fabric having "ease" or "stretch" imparted thereto by the method of Claim 1.

15. A waistband incorporating outer fabric and/or lining fabric and/or interlining fabric treated in accordance with the method of Claim 1.

1/7



2/7

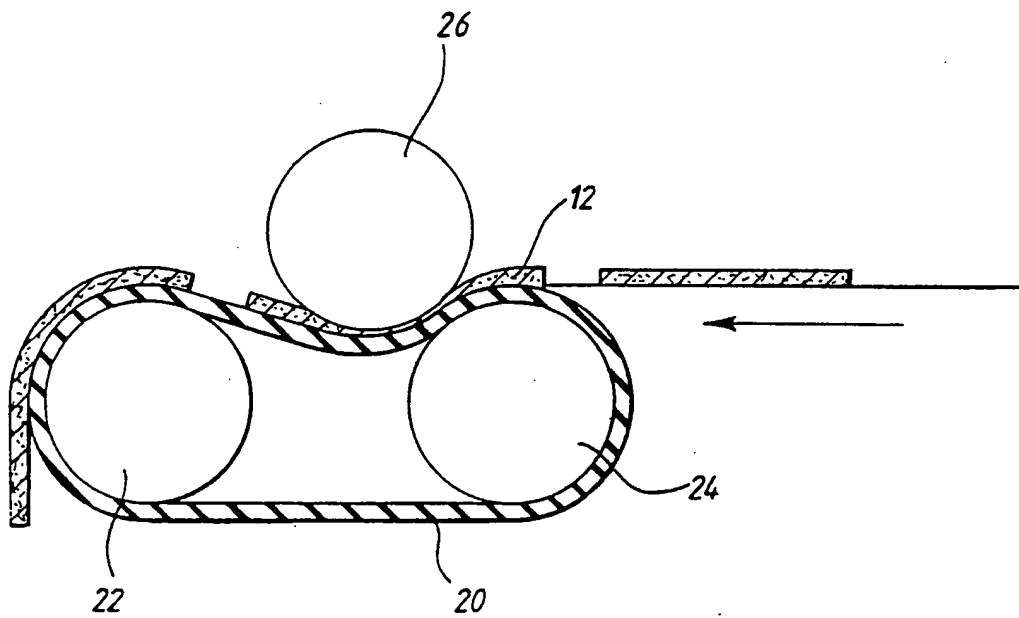
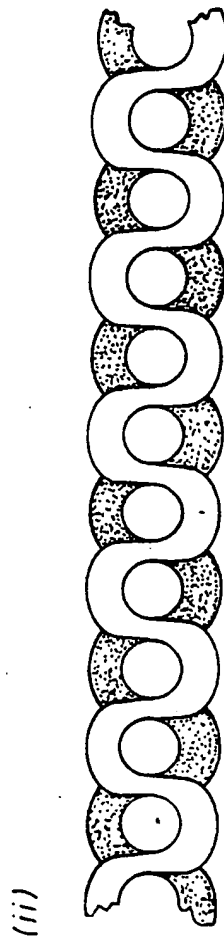
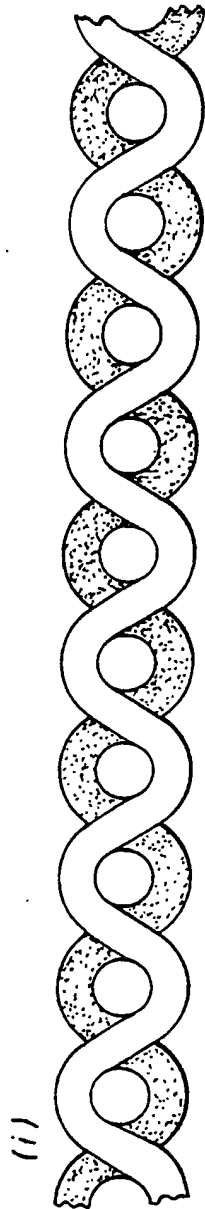


FIG.2.

3/7

FIG. 3.



4/7

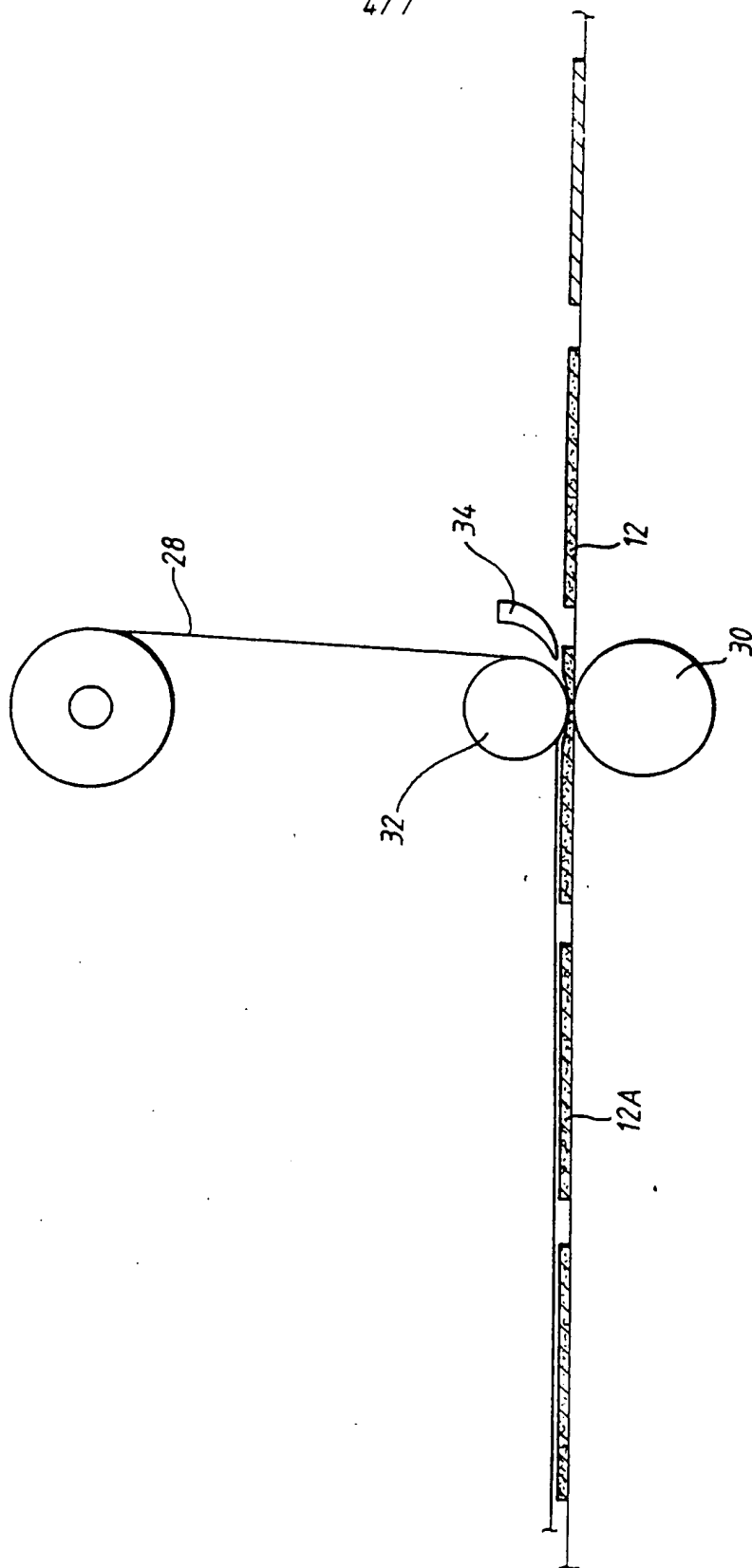


FIG. 4.



5/7

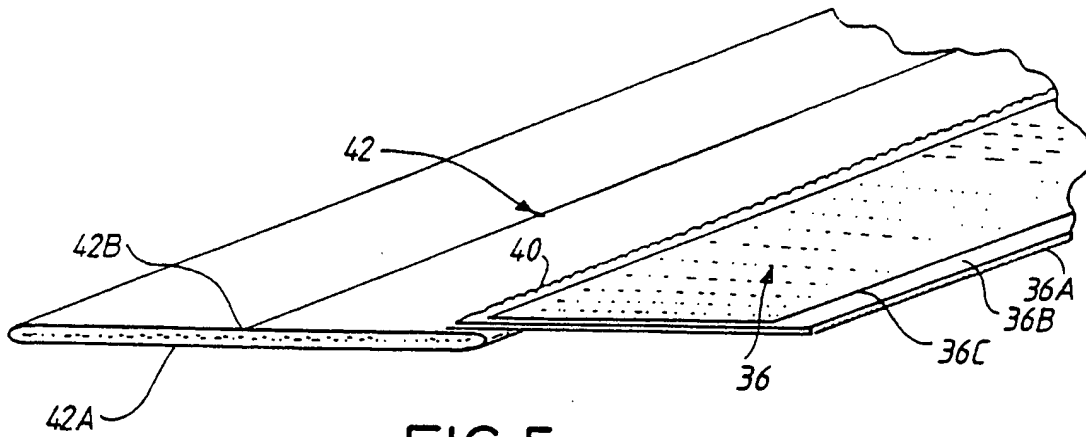


FIG. 5.

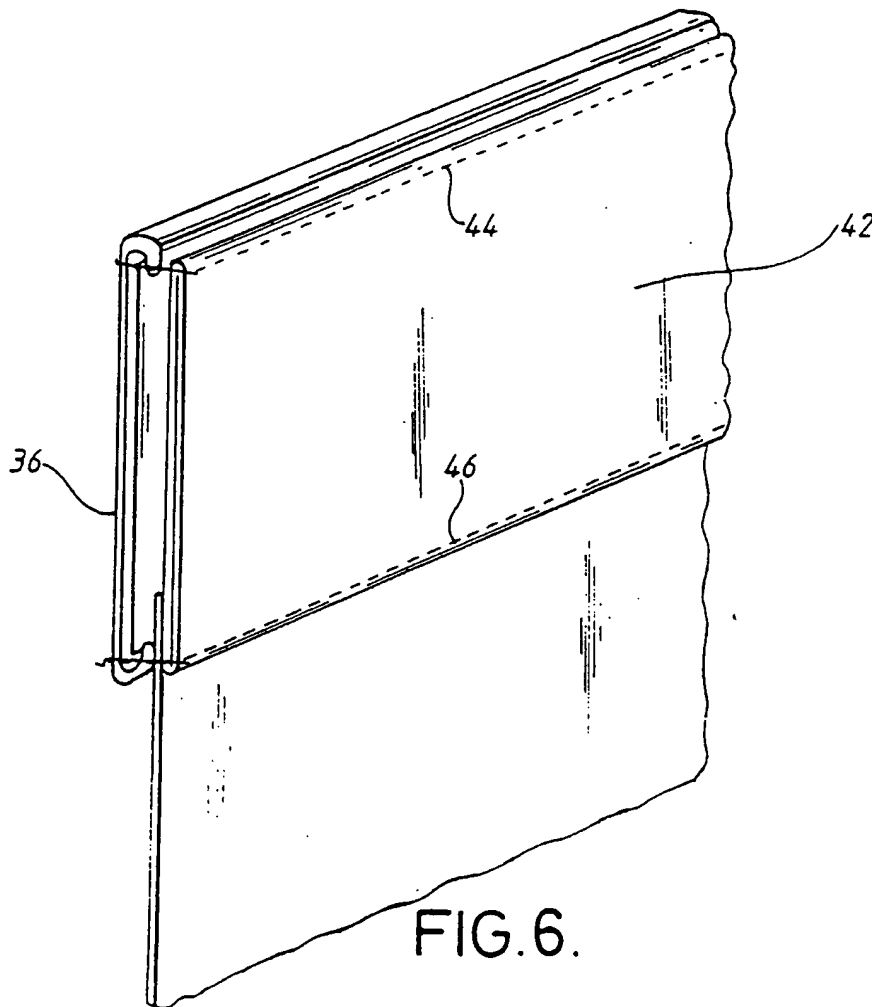


FIG. 6.

6/7

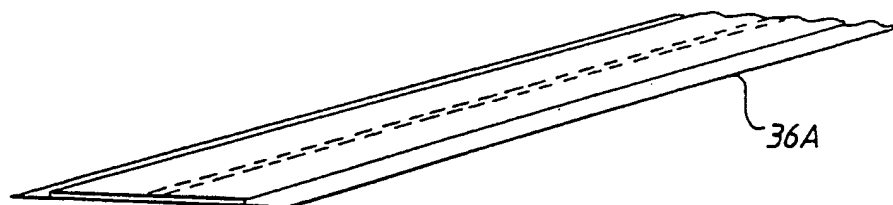


FIG. 7.

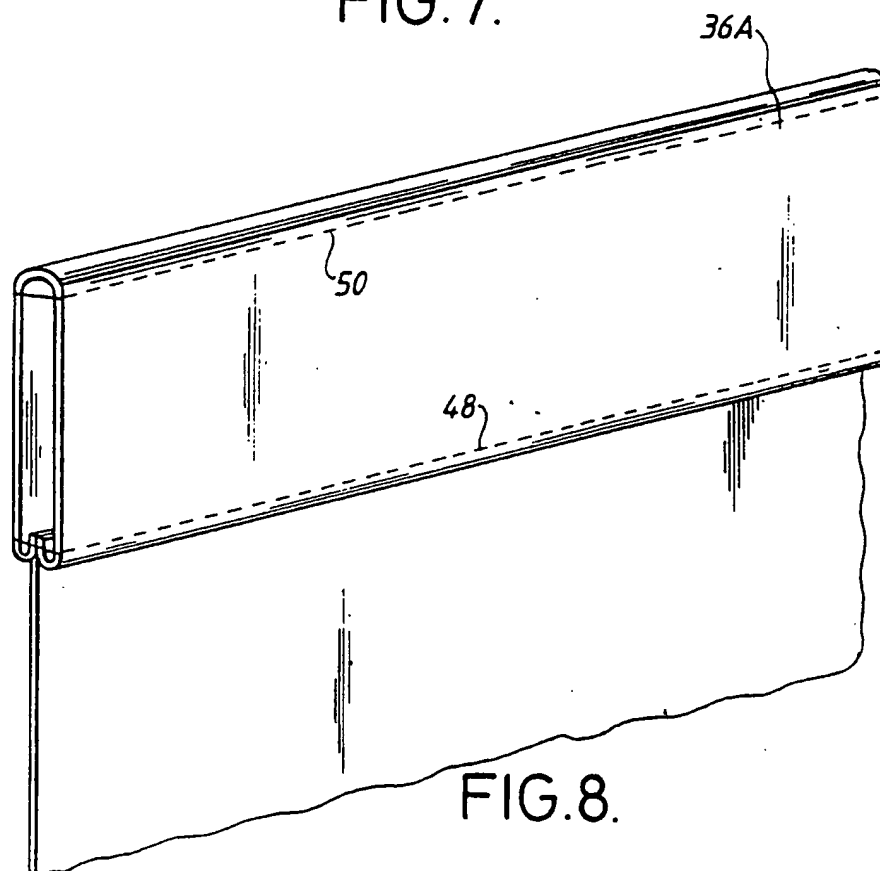
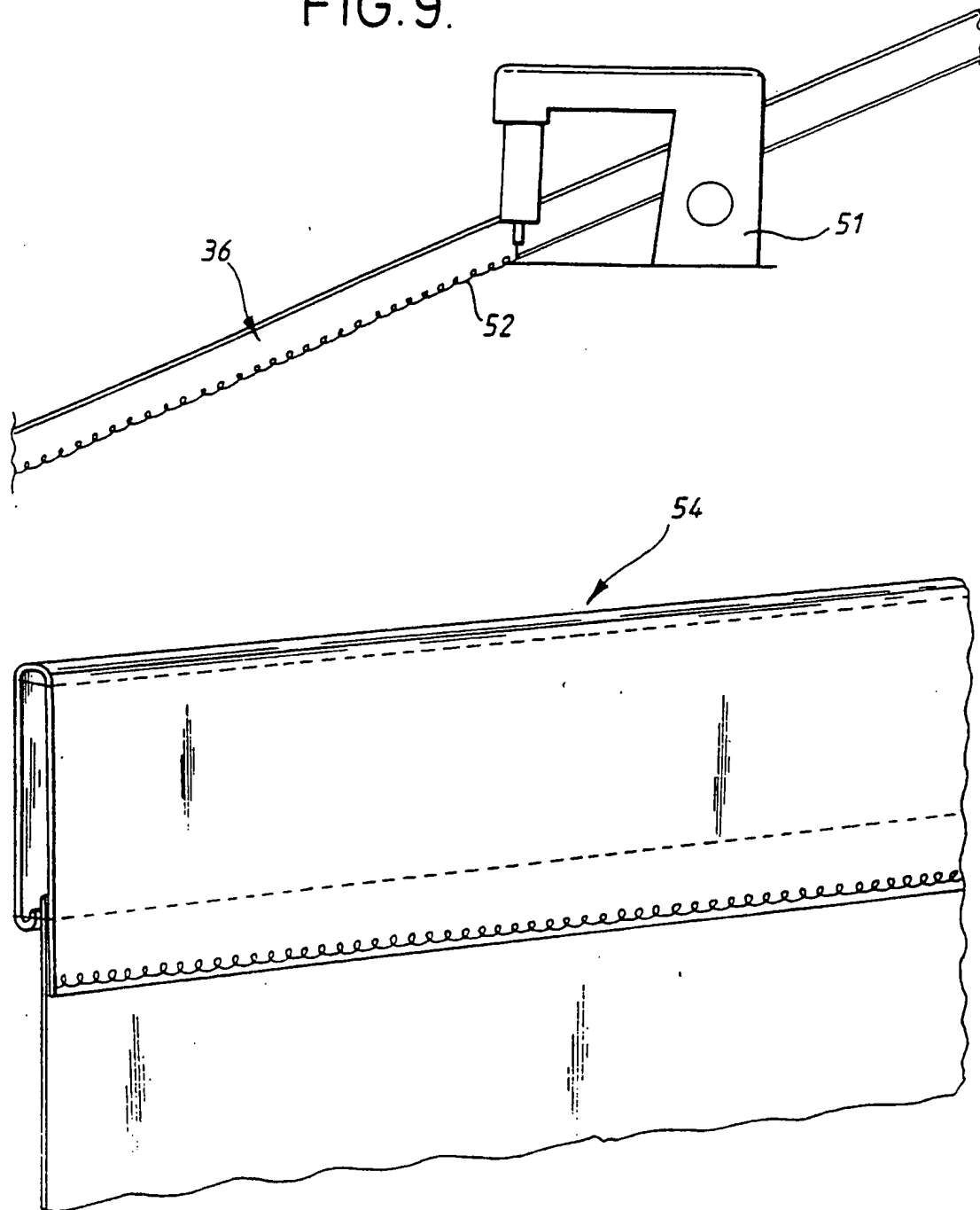


FIG. 8.

7/7

FIG. 9.



## INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/GB 94/01079

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 5 D06C21/00

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 5 D06C A41F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US,A,4 051 215 (TSURUTA ET AL) 27 September 1977 see column 2, line 24 - column 3, line 32; figure 1	1,9-12, 14
A	DE,A,24 44 923 (DAY'S, INC.) 8 April 1976 see claims 1-4; figures 1-16	1,4,5
A	US,A,3 382 552 (DAVIS ET AL) 14 May 1968	
A	US,A,3 504 712 (DUSENBURY ET AL) 7 April 1970	
A	US,A,3 723 993 (RUBY) 3 April 1973	

☐ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

## \* Special categories of cited documents :

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\*T\* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

\*X\* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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\*&\* document member of the same patent family

Date of the actual completion of the international search

15 September 1994

Date of mailing of the international search report

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 94/01079

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A-3723993	03-04-73	NONE	